Physical Review B - Condensed Matter and Materials Physics 2008 vol.78 N23

Adiabatic optical entanglement between electron spins in separate quantum dots

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Abstract

We present an adiabatic approach to the design of entangling quantum operations with two electron spins localized in separate InAs/GaAs quantum dots via the Coulomb interaction between optically excited localized states. Slowly varying optical pulses minimize the pulse noise and the relaxation of the excited states. An analytical "dressed-state" solution gives a clear physical picture of the entangling process and a numerical solution is used to investigate the error dynamics. For two vertically stacked quantum dots we show that, for a broad range of dot parameters, a two-spin state with concurrence C>0.85 can be obtained by four optical pulses with durations ~0.1-1 ns. © 2008 The American Physical Society.

http://dx.doi.org/10.1103/PhysRevB.78.235314